CLAIMS

1. A method for determining the risk of reproductive failure in a cell comprising:

obtaining at least one chromosome from the cell;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby determine the risk of reproductive failure in the cell.

2. The method of claim 1, wherein the cell is an oocyte, an oocyte representative of a population of oocytes, a polar body from a fertilized oocyte, or a polar body from an unfertilized oocyte.

3. The method of claim 2, wherein the cell is an oocyte.

4. The method of claim 1, wherein a labeled telomere-specific probe is hybridized to the chromosome prior to measuring telomere length of the chromosome.

5. The method of claim 4, wherein the probe is hybridized to telomere repeats.

6. The method of claim 4, wherein the probe is peptide nucleic acid (PNA)-labeled.

7. The method of claim 1, wherein the telomere is measured using quantitative fluorescent *in situ* hybridization (Q-FISH) analysis.

8. The method of claim 1 for use in *in vitro* fertilization (IVF).

9. A method for determining the risk of reproductive failure in a cell comprising:

obtaining at least one chromosome from at least one cell in a population of cells representative of said cell;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby determine the risk of reproductive failure in the cell.

10. A method for determining the risk of reproductive failure in an oocyte comprising:

obtaining at least one chromosome from at least one oocyte in a population of oocytes representative of said oocyte;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby determine the risk of reproductive failure in the oocyte.

11. A method for determining the risk of reproductive failure in a subject comprising:

obtaining from said subject at least one chromosome from at least one oocyte in a population of oocytes representative of said oocyte;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby determine the subject's risk of reproductive failure.

12. A method for determining the risk of reproductive failure in an oocyte comprising:

obtaining at least one chromosome from at least one oocyte in a population of oocytes representative of said oocyte;

hybridizing telomere-specific probes to said chromosome;

performing quantitative fluorescent *in situ* hybridization (Q-FISH) analysis;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby determine the risk of reproductive failure in the oocyte.

13. A method for determining the predisposition of an oocyte to reproductive failure comprising:

obtaining at least one chromosome from the oocyte;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby determine the predisposition of the oocyte to reproductive failure.

14. The method of claim 13, wherein a labeled telomere-specific probe is hybridized to the chromosome prior to measuring telomere length of the chromosome.

15. The method of claim 14, wherein the probe is hybridized to telomere repeats.

16. The method of claim 14, wherein the probe is peptide nucleic acid (PNA)-labeled.

17. The method of claim 14, wherein the telomere is measured using quantitative fluorescent *in situ* hybridization (Q-FISH) analysis.

18. The method of claim 13, wherein the oocyte is representative of a population of oocytes.

19. A method for selecting a fertilized oocyte with a low risk of reproductive failure for *in vitro* fertilization, comprising:

obtaining at least one chromosome from the polar body of the fertilized oocyte;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby select a fertilized oocyte with a low risk of reproductive failure for *in vitro* fertilization.

20. A method of *in vitro* fertilization comprising:
selecting a fertilized oocyte according to the method of claim 19; and
implanting the selected fertilized oocyte in the subject.

21. The method of claim 20, wherein the subject is a human.

22. A method for optimizing the viability of an embryo comprising:
selecting a fertilized oocyte according to the method of claim 19; and
implanting the selected fertilized oocyte in a subject.

23. The method of claim 22, wherein the subject is a human.

24. A method for determining the risk of aneuploidy in a cell comprising:
obtaining at least one chromosome from the cell;
measuring telomere length of the chromosome; and
comparing the measured length of the telomere to the standardized average length of a control telomere;
to thereby determine the risk of aneuploidy in the cell.

25. The method of claim 24, wherein the cell is selected from the group consisting of an oocyte, an oocyte representative of a population of oocytes, a polar body from a fertilized oocyte, and a polar body from an unfertilized oocyte.

26. The method of claim 24, wherein a labeled telomere-specific probe is hybridized to the chromosome prior to measuring telomere length of the chromosome.

27. The method of claim 26, wherein the probe is hybridized to telomere repeats.

28. The method of claim 26, wherein the probe is peptide nucleic acid (PNA)-labeled.

29. The method of claim 26, wherein the telomere is measured using quantitative fluorescent *in situ* hybridization (Q-FISH) analysis.

30. The method of claim 26 for use *in vitro* fertilization (IVF).

31. A method for determining the risk of aneuploidy in a cell comprising:

obtaining at least one chromosome from at least one cell in a population of cells representative of said cell;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby determine the risk of aneuploidy in the cell.

32. A method for determining the risk of aneuploidy in an oocyte comprising:

obtaining at least one chromosome from at least one oocyte in a population of oocytes representative of said oocyte;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby determine the risk of aneuploidy in the cell.

33. A method for determining the risk of aneuploidy in an oocyte comprising:

obtaining at least one chromosome from at least one oocyte in a population of oocytes representative of said oocyte;

hybridizing telomere-specific probes to said chromosome;

performing quantitative fluorescent *in situ* hybridization (Q-FISH) analysis;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby determine the risk of aneuploidy in the cell.

34. A method for selecting a fertilized oocyte with a low risk of aneuploidy for *in vitro* fertilization, comprising:

obtaining at least one chromosome from the polar body of the fertilized oocyte;

hybridizing telomere-specific probes to said chromosome;

performing quantitative fluorescent *in situ* hybridization (Q-FISH) analysis;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby select a cell with a low risk of aneuploidy.

35. A method for determining the predisposition of an oocyte to aneuploidy comprising:

obtaining at least one chromosome from the oocyte;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere;

to thereby optimize the viability of the embryo.

36. The method of claim 35, wherein a labeled telomere-specific probe is hybridized to the chromosome prior to measuring telomere length of the chromosome.

37. The method of claim 36, wherein the probe is hybridized to telomere repeats.

38. The method of claim 36, wherein the probe is peptide nucleic acid (PNA)-labeled.

39. The method of claim 35, wherein the telomere is measured using quantitative fluorescent *in situ* hybridization (Q-FISH) analysis.

41. The method of claim 35, for use *in vitro* fertilization.

42. The method of claim 35, wherein the oocyte is representative of a population of oocytes.

43. A method of pre-implantation genetic testing to identify an oocyte with a predisposition to aneuploidy comprising:

obtaining at least one chromosome from the oocyte;

measuring telomere length of the chromosome; and

comparing the measured length of the telomere to the standardized average length of a control telomere.

44. The method of claim 43, wherein a labeled telomere-specific probe is hybridized to the chromosome prior to measuring telomere length of the chromosome.

45. The method of claim 43, wherein the telomere is measured using quantitative fluorescent *in situ* hybridization (Q-FISH) analysis.

46. The method of claim 43 for use *in vitro* fertilization (IVF).

47. The method according to any of the preceding claims, further comprising obtaining a probe for hybridizing to the chromosome.

48. The method according of claim 47, wherein said probe is a labeled telomere-specific probe.

49. The method according to any one of the preceding claims, wherein the telomere specific probe comprises a nucleic acid sequence identified by any one of SEQ ID NOS: 1 through 10.

50. The method according to any one of the preceding claims, wherein the telomere specific probe comprises a nucleic acid sequence having at least about 80 percent sequence identity to any one of SEQ ID. NOS. 1 through 10.

51. The method according to any one of the preceding claims, wherein the telomere specific probe comprises a nucleic acid sequence having at least about 90 percent sequence identity to any one of SEQ ID. NOS. 1 through 10.

52. A kit for determining the risk of reproductive failure and/or aneuploidy in a cell comprising
reagents for preparing a chromosomal spread from the cell or at least one cell in a population of cells representative of said cell; labeled telomere-specific repeat probes; reagents for performing quantitative fluorescent *in situ* hybridization (Q-FISH) analysis on the chromosomal spread; and instructions for measuring the length of a telomere obtained from the chromosomal spread, or obtained from a chromosome of said cell, and comparing the measured length of the telomere to the standardized average length of a control.

53. The kit of claim 52, wherein the chromosome is obtained from a cell selected from the group consisting of an oocyte, an oocyte representative of a population of oocytes, or the polar body from a fertilized or unfertilized oocyte.

54. The kit of claim 52, wherein the probes are peptide nucleic acid (PNA)-labeled.